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ABSTRACT

During 1999/2000, the Saginaw, Michigan public schools implemented a reduced class size program in grades 1 and 2. At grade 1 (23 rooms), reduced-size classes were maintained at no more than 18 pupils; at grade 2 (5 rooms), the limit was 21 pupils. Comparison classes were identified to assess the impact of the program. Students in both conditions were included in analyses of reading and math achievement and rates of special education placement, attendance, and promotion. At grade 1, no significant differences between the groups were found at the beginning or end of the year in reading or math. Similarly, no differences were found in any of the above-mentioned rates. At grade 2, students in reduced-size classes evidenced greater performance in reading (text leveling) at the end of the year; however, no pre-test was conducted on text leveling. In mathematics, the reduced-size class condition demonstrated higher performance at the end of the year. As with grade 1, there were no significant differences on other measures. (Concludes with recommendations to improve the assessment process. Appendices contain test results.) (EV)

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EVALUATION REPORT

A STUDY OF A REDUCED CLASS SIZE PROGRAM, GRADES 1 & 2

1999/2000

DEPARTMENT OF EVALUATION SERVICES

- PROVIDING ASSESSMENT, PROGRAM EVALUATION AND RESEARCH SERVICES -

SCHOOL DISTRICT OF THE CITY OF SAGINAW

Saginaw, Michigan

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A STUDY OF A REDUCED CLASS SIZE PROGRAM, GRADES 1 & 2

1999/2000

An Approved Report of the

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August, 2000

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Introduction

The School District of the City of Saginaw received funding during 1999/2000 for a Class Size Reduction Program. A total of 17 elementary buildings participated where either first and/or second classrooms were established to remain as a reduced size site (18 or less at first and 21 or less at second grade).

Table 1, below, presents the number of schools, classrooms, and students involved in the class size reduction study in grades one and two at the beginning of the school year.

Table 1

Count of Schools, Classrooms, and Students

	EXPERIMENTAL			CONTROL		
Grade	Schools	Classrooms	Students	Schools	Classrooms	Students
1	13	23	365	7	10	217
2	4	5	97	4	5	145
Total	17	28	462	11	15	362

N=824. School totals are duplicated counts.

The specific decisions as to which classrooms were kept at a reduced class size (experimental) were made on the bases of physical facilities available and the relative number of at-risk students at each building. Comparison classrooms (control) that were expected to maintain a class size of at least 21 students (grade one) were identified for the purposes of this study. Similarly, at grade two control classrooms were identified as those expected to maintain a class size of at least 28 or more.

In the next section there will be a presentation of the research methods used to assess the outcomes of this program.

Methods

Experimental reduced class size rooms in grade one (maintained at 18 or less pupils) and grade two (maintained at 23 or less pupils) were compared to control class size rooms (grade one [21 or more] and grade two [28 or more]) on outcome variables. These variables include: 1) student performance data on district achievement measures, 2) student attendance rates, 3) grade promotion rates, and 4) rates of special education placement. The time span of the program was from September 9, 1999 to June 8, 2000.

These outcome variables and the associated statistical tests used for the comparisons for the first year of the study are more fully described in the matrix below.

Variable	Measurement	Statistical Test for Comparison
Pre-Post Test		
Reading Achievement	Six scores (letter identification, word test, concepts about print, writing vocabulary, hearing and recording sounds in words and text leveling) from **An Observation Survey of Early Literacy Behaviors** (Grade 1)	Median Text ($\alpha = 0.05$)
Mathematics Achievement	**California Achievement Tests** (CAT/5) – Mathematics Concepts and Applications Subtest Score	Median Test ($\alpha = 0.05$)
Post Only		
Reading Achievement	Text leveling from **An Observation Survey of Early Literacy Behavior** (Grade 2)	Median Test ($\alpha = 0.05$)
Special Education Placement Rates	Number of students assigned an Individual Education Plan (IEP) for learning and/or social emotional difficulties divided by total number of students in that group and multiplied by 100	Standard Error of a Percentage (95% confidence interval)
Student Attendance Rates	Number of days absent divided by total possible days in attendance multiplied by 100 and then that quantity subtracted from 100	Standard Error of a Percentage (95% confidence interval)
Student Promotion Rates	Number retained divided by total number in group multiplied by 100 and then subtracted from 100	Standard Error of a Percentage (95% confidence interval)

In addition, a survey of stakeholder (parents, teachers, and principals) attitudes was conducted. Those results are available under a separate cover from Evaluation Services.

Findings

Participants

Below are descriptions (Table 2 for grade one and Table 3 for grade two) of the students who were either in reduced or control classes during the 1999/2000 school year and also entered into an analysis of the results.

Table 2

Counts by Gender, Racial/Ethnic Category and Total of Grade 1 Reduced and Traditional Class Size Participants

Variable	Categories	Experimental (Reduced) #	Experimental (Reduced) %	Control (Traditional) #	Control (Traditional) %
Gender	Male	162	49.8	96	47.8
	Female	163	50.2	105	52.2
		325	100.0	201	100.0
Racial/Ethnic	American Indian	1	0.3	2	1.0
	White	48	14.8	73	36.3
	Hispanic	48	14.8	22	11.0
	Black	228	70.1	101	50.2
	Oriental	0	0.0	3	1.5
		325	100.0	201	100.0
Total Grade 1		325	100.0	201	100.0

N=526.

Table 3

Counts by Gender, Racial/Ethnic Category and Total of Grade 2 Reduced and Traditional Class Size Participants

Variable	Categories	Experimental (Reduced) #	Experimental (Reduced) %	Control (Traditional) #	Control (Traditional) %
Gender	Male	32	49.2	65	55.0
	Female	33	50.8	54	45.0
		65	100.0	120	100.0
Racial/Ethnic	American Indian	1	1.5	0	0.0
	White	16	24.6	10	8.3
	Hispanic	5	7.7	9	7.5
	Black	43	66.2	100	83.3
	Oriental	0	0.0	1	0.9
		65	100.0	120	100.0
Total Grade 2		65	100.0	120	100.0

N=185.

As shown in Tables 2 and 3 above, at both grades the control appears to be representative of the experimental in terms of gender. However, the relative percentage of black students is greater in the experimental than in the control at grade one and vice versa at grade two.

Reading Results

Table 4, on the following page, presents the pre and post median test results from the **Observation Survey in Early Literacy Behaviors** for grade one and post-only median test results in text leveling for grade two. Reduced and traditional counts above and below the combined median for each contrast can be found in Appendix A.

Table 4

Median Test Results For The Observation Survey In Early Literacy Behaviors, Reduced Versus Traditional Class Size

Subtest	Grade	N Above or Below Median	Pre χ^2	N Above or Below Median	Post χ^2
Letter Identification	1	438	0.057	196*	NA
Ohio Word Test	1	370	0.003	387	1.393
Concepts About Print	1	430	2.038	403	0.325
Writing Vocabulary	1	415	1.748	445	2.832
Dictation Task	1	442	0.001	398	0.463
Text Leveling	1	364	0.783	400	0.583
Text Leveling	2	-	-	95	17.88

Note. $\chi^2 \geq 3.84$ for $\alpha = 0.05$; therefore none of the differences between the groups in Grade 1 were statistically significant. In Grade 2, the difference was statistically significant.

* The post-test median was the highest possible letter identification score – thus no students scored above the median and no median test was possible.

A review of the findings in Table 4 above illustrates that there was no difference between the groups in reading achievement as measured by the Observation Survey at grade one either at the start (pre-test) or the end of the year (post-test). However, at the second grade level, at the end of the year there was a significant difference in achievement on text leveling between the groups favoring the reduced class size condition. This latter finding should be considered with caution since it is unknown whether the differences existed at the beginning of the school year.

Math Results

Table 5, on the following page, presents the median test results in mathematics for grades one and two. An examination of the percentage of students above and below the combined median for experimental and control groups is presented in Appendix B for interested readers.

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Table 5

Median Test Results for The California Achievement Test in Mathematics in Grade 1 & 2 Reduced Class Size Study

Subtest	N Above or Below Median	Pre χ^2	N Above or Below Median	Post χ^2
Math Concepts and Applications (Grade 1)	419	0.0008	426	0.0072
Math Concepts and Applications (Grade 2)	174	3.3802	177	4.4537

Note. $x^2 \geq 3.84$ $\alpha = 0.05$; therefore, none of the differences between the groups were statistically significant except for the post results at grade 2.

A review of the statistics in Table 5 above reveals that at grade one there was no statistically significant difference between the groups with regards to the achievement they evidenced in mathematics. At grade two there was no statistically significant difference at the beginning of the year, but at the end of the year there was a statistically significant difference favoring the experimental condition (reduced size).

Changes in Rates

Table 6, on the following page, displays the rates for Special Education Placement, Student Attendance, and Student Promotion for Grade 1.

Table 6
Standard Error of Percentages (Rates) for Grade 1 Reduced Class Size Study

Variable Under Study	Measurement	Experimental Group (N=325)			Control Group (N=201)			Significant Difference? (non-overlap of confidence intervals)
		Rate %	Standard Error %	95% Confidence Interval %	Rate %	Standard Error %	95% Confidence Interval %	
Special Education Placement Rates	Number of students assigned an Individual Education Plan (IEP) for learning and/or social emotional difficulties divided by total number of students in that group and multiplied by 100	**1.84**	0.74	1.1 to 2.58	**3.48**	1.29	2.19 to 4.77	No
Student Attendance Rates	Number of days absent divided by total possible days in attendance multiplied by 100 and then that quantity subtracted from 100	**92.20**	1.48	90.72 to 93.68	**92.95**	1.80	91.15 to 94.75	No
Student Promotion Rates	Number retained divided by total number in group multiplied by 100 and then subtracted from 100	**92.62**	1.41	91.21 to 94.02	**93.54**	1.73	91.81 to 95.27	No

N=526.

Examining Table 6 one can see no statistically significant differences between the experimental and control groups with regards to any of these three rates.

Table 7, on the following page, provides the same rates by condition for grade 2.

Table 7

Standard Error of Percentages (Rates) for Grade 2 Reduced Class Size Study

Variable Under Study	Measurement	Experimental Group (N=65)			Control Group (N=120)			Significant Difference? (non-overlap of confidence intervals)
		Rate %	Standard Error %	95% Confidence Interval %	Rate %	Standard Error %	95% Confidence Interval %	
Special Education Placement Rates	Number of students assigned an Individual Education Plan (IEP) for learning and/or social emotional difficulties divided by total number of students in that group and multiplied by 100	**1.53**	1.52	0.1 to 3.05	**0.00**	-	-	Not Defined
Student Attendance Rates	Number of days absent divided by total possible days in attendance multiplied by 100 and then that quantity subtracted from 100	**87.96**	4.03	83.93 to 91.99	**88.25**	2.93	85.32 to 91.18	No
Student Promotion Rates	Number retained divided by total number in group multiplied by 100 and then subtracted from 100	**93.85**	2.97	90.88 to 96.82	**96.70**	1.63	95.07 to 98.33	No

N=185. Note: Because there were no special education placements in the control, statistically significant differences cannot be determined.

After reviewing Table 7 one can see that there are no statistically significant differences between the groups in the attendance and promotion rates. Because there were no special education placements in the control group statistically significant difference cannot be determined. However, since there was only one placement in the second grade experimental group, it would not appear that there is a substantial difference.

In the next section, a summary of these findings will be provided.

Summary

During 1999/2000 the Saginaw Public Schools implemented a reduced class size program in grades one and two. At grade one reduced sized classes were maintained at no more than 18 pupils (21 pupils at grade two) and comparison classes were identified to assess the impact of the program. The majority of the reduced class sized rooms were at first grade (23) versus five rooms at second grade.

Students in both conditions (experimental and control) were included in analyses of reading and math achievement and rates of special education placement, attendance, and promotion. At the first grade no significant differences between the groups were found at the beginning or end of the year in reading or math. Similarly, no differences were found in any of the above mentioned rates.

At second grade, in reading, students in reduced class size evidenced greater performance in reading (text leveling) at the end of the year. The reader should recall that there was no pre-test measure of difference in text leveling. In mathematics, the reduced class sized condition demonstrated higher performance at the end of the year but there was no statistically significant differences between the grades at the beginning of the year. As with the first grade, no significant differences were found between the second grade groups with the above mentioned rates.

CONCLUSIONS AND RECOMMENDATIONS

If reduced class size classrooms were truly implemented (e.g., students randomly assigned to experimental and control conditions), then it may be concluded that they, as a group, had little or no effect beyond what was happening in the traditionally sized classrooms in the areas under study. However, it is possible that the program may not have been implemented as intended. Likewise, measurement instruments/procedures may have been insufficiently sensitive to identify any differences.

A series of recommendations follow that should be considered to improve implementation of the program.

- Classrooms to be identified as ones to maintain at reduced class size and those to be used as a comparison class should be identified prior to the beginning of the school year so that students will have the opportunity to have a full year's worth of treatment.

- In order to determine if differences occur because of the treatment, efforts should be made to best assure that differences do not exist at the beginning of the year. Random assignment of students to conditions would be an optimal way to achieve this. Alternately random assignment of classrooms to conditions may be an acceptable way to meet this need.

- Given the limited scope of the Observation Survey there may be differences in reading comprehension achievement which were not in evidence. Alternative measures, which are standardized, should be considered as accompanying measures in future assessments.

- If the Observation Survey is to be continued to be used, then inservices concerning its administration should be provided to all teachers who will administer it. Inter-rater reliability should be measured to determine its consistency of measurement across teachers and reported in the next evaluation of this program.

- Among the findings of the Parent Survey (available under separate cover) was that some parents would have liked their students to have had teachers who were more sensitive to the student's individual needs. Professional development activities for reduced class size teachers should be provided that deal with one to one instructional techniques that focus in on student's individual needs.

- As operationalized this year, the experimental condition was considered solely in terms of reduction in class size, it may be that inconsistencies within curriculum delivery resulted in sufficiently different types of treatment within the experimental condition. This may be an explanation why there were no differences between the experimental and control groups. Thus, efforts should be made to describe and compare curriculum delivery, particularly where the delivery is done differently because of the smaller size of the class.

- Most likely because there are fewer students in reduced sized classrooms there would be more time to devote to instruction particularly in areas such as science, social studies, and writing. Ostensibly, students in the reduced class size setting would have exposure to and facility with these additional topics. To determine whether this is the case, the District should develop (or purchase) reliable and valid instruments consistent with the respective standards and benchmarks to test these topics at the grades.

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APPENDICES

APPENDIX A

GRADE 1 – Reduced Class Size Study Median Test Reading Results

Letter Identification (LI)

Pre (MD* = 49)

	Less than 49		Greater than 49		
Experimental	125	(48.6)	132	(51.4)	257
Control	83	(45.9)	98	(54.1)	181

$x^2 = 0.057$

Not Significant ($\alpha = 0.05$)

Post (MD = 54)

	Less than 54		Greater than 54		
	106	(100.0)	0	(0.0)	106
	90	(100.0)	0	(0.0)	90

Because the overall median is at the ceiling of the test, no significant difference can be found.

Ohio Word Test (OWT)

Pre (MD = 1)

	Less than 1		Greater than 1		
Experimental	110	(51.9)	102	(48.1)	212
Control	81	(51.3)	77	(48.7)	158

$x^2 = 0.003$

Not Significant ($\alpha = 0.05$)

Post (MD = 19)

	Less than 19		Greater than 19		
	91	(40.1)	136	(59.9)	227
	79	(49.4)	81	(50.6)	160

$x^2 = 1.393$

Not Significant ($\alpha = 0.05$)

Concepts About Print (CAP)

Pre (MD = 8)

	Less than 8		Greater than 8		
Experimental	46	(18.5)	202	(81.5)	248
Control	19	(10.4)	163	(89.6)	182

$x^2 = 2.038$

Not Significant ($\alpha = 0.05$)

Post (MD = 20)

	Less than 20		Greater than 20		
	124	(53.7)	107	(46.3)	231
	101	(58.7)	71	(41.3)	172

$x^2 = 0.325$

Not Significant ($\alpha = 0.05$)

Note. $x^2 \geq 3.84$ $\alpha = 0.05$; therefore, none of the differences between the groups were statistically significant.

*MD = Median of entire group (Experimental and Control)

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APPENDIX A

Writing Vocabulary (WV)

Pre (MD = 5)

	Less than 5	Greater than 5	
Experimental	95 (39.7)	144 (60.3)	239
Control	88 (50.0)	88 (50.0)	176

$x^2 = 1.748$

Not Significant ($\alpha = 0.05$)

Post (MD = 44)

	Less than 44	Greater than 44	
Experimental	113 (44.0)	144 (56.0)	257
Control	107 (56.9)	81 (43.1)	188

$x^2 = 2.832$

Not Significant ($\alpha = 0.05$)

Dictation Task (DIC)

Pre (MD = 10)

	Less than 10	Greater than 10	
Experimental	120 (46.9)	136 (53.1)	256
Control	86 (46.2)	100 (53.8)	186

$x^2 = 0.001$

Not Significant ($\alpha = 0.05$)

Post (MD = 35)

	Less than 35	Greater than 35	
Experimental	101 (43.3)	132 (56.7)	233
Control	81 (49.1)	84 (50.9)	165

$x^2 = 0.463$

Not Significant ($\alpha = 0.05$)

Text Leveling (TL)

Pre (MD = 10)

	Less than 10	Greater than 10	
Experimental	113 (53.3)	99 (46.7)	212
Control	92 (60.5)	60 (39.5)	152

$x^2 = 0.783$

Not Significant ($\alpha = 0.05$)

Post (MD = 35)

	Less than 35	Greater than 35	
Experimental	112 (48.1)	121 (51.9)	233
Control	91 (54.5)	76 (45.5)	167

$x^2 = 0.583$

Not Significant ($\alpha < 0.05$)

GRADE 2 – Reduced Class Size Study Median Test Reading and Math Results

Reading – Text Leveling (TL)

Post (MD = 28)

	Less than 28	Greater than 28	
Experimental	23 (60.5)	15 (39.5)	38
Control	50 (87.7)	7 (12.3)	57

$x^2 = 17.88$

Significant ($\alpha = 0.05$)

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APPENDIX B

Reduced Class Size Study Test Math Results

Grade 1 California Achievement Test (CAT) Math Concepts and Applications

	Pre (MD* = 36)			Post (MD = 49)		
	Less than 36	Greater than 36		Less than 49	Greater than 49	
Experimental	124 (48.2)	133 (51.8)	257	134 (49.4)	137 (50.6)	271
Control	80 (49.4)	82 (50.6)	162	76 (49.0)	79 (51.0)	155
	$x^2 = 0.0008$			$x^2 = 0.0072$		
	Not Significant ($\alpha = 0.05$)			Not Significant ($\alpha = 0.05$)		

Grade 2 California Achievement Test (CAT) Math Concepts and Applications

	Pre (MD = 42)			Post (MD = 43)		
	Less than 42	Greater than 42		Less than 43	Greater than 43	
Experimental	26 (42.6)	35 (57.4)	61	24 (39.3)	37 (60.7)	61
Control	64 (56.6)	49 (43.4)	113	64 (55.2)	52 (44.8)	116
	$x^2 = 3.3802$			$x^2 = 4.4537$		
	Not Significant ($\alpha = 0.05$)			Significant ($\alpha < 0.05$)		

Note. $x^2 \geq 3.84$ $\alpha = 0.05$; therefore, one comparison between the groups was statistically significant.

*MD = Median of entire group (Experimental and Control)

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